February 12, 1846.

GEORGE RENNIE, Esq., Treasurer and V.P., in the Chair.

"A Practical Extension of the application of the Law of Mortality announced by B. Gompertz, Esq., in the Philosophical Transactions for 1823." By A. M. Drach, Esq. Communicated by B. Gompertz, Esq., F.R.S.

In endeavouring to verify the theoretical law of mortality, announced by Mr. Gompertz, by means of constants derived from the results of the English census of 1841, which are contained in the sixth Annual Report of the Registrar-General, and which furnish an extended basis for computation, the author found the accordance between the two to be so remarkably close as to justify the assumption that Mr. Gompertz's formula expresses the true law of the decrement of human life. The paper is occupied with the analytical details of this investigation.

"On Spontaneous Nitrification." By C. F. Schœnbein, Professor of Chemistry in the University of Bâle. Communicated by Michael Faraday, Esq., D.C.L., F.R.S., &c.

From various facts adduced by the author, he is led to the conclusion, that during the slow combustion of phosphorus in moist atmospheric air, while ozone is produced, there is also formed a quantity of nitric acid; and that in all cases where both these compound bodies are simultaneously generated, however different may be the concomitant circumstances of the experiment, there is strong reason to suspect that the formation of the one is in some way connected with that of the other.

"On the Process of Etching, or Engraving, by means of Voltaic Electricity." By James H. Pring, M.D. Communicated by P. M. Roget, M.D., Sec. R.S.

The author, referring to an account which he gave of his method of etching on hardened steel plates, or other polished metallic surfaces, by means of electricity, in the Philosophical Magazine for November 1843, offers some additional observations relating to the theory of the process, and states some further practical remarks in its application to engraving. A specimen of a steel plate, and of a razor, on which ornamental designs were engraved by this method, were laid before the Society, in illustration.

February 19, 1846.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

James Matheson, Esq., William West, Esq., and John Wilson, M.D., were elected Fellows of the Society.

"On the Mechanism of Respiration." By Francis Sibson. Communicated by Thomas Bell, Esq., F.R.S.

This paper is almost entirely occupied with anatomical details, collected from an extensive series of dissections of the muscles and

bones concerned in the act of respiration in man and the lower animals, for the purpose of elucidating the mechanism of their action both in inspiration and in expiration; accompanied by a great number of illustrative diagrams and drawings. The author commences with the serpent tribes, which present the simplest form of ribs, being attached only at their vertebral ends, while their anterior ends are free. When these ribs are brought forwards by the action of the levatores costarum and external intercostal muscles, the chest is expanded; and when drawn backwards by the long depressors, internal intercostals and transversales, expiration is effected. In birds there are added to the former apparatus a sternum, and a series of sternal ribs, the respiratory movements of which are performed in directions the reverse of those of the vertebral ribs. During inspiration, the angles between the vertebral and sternal ribs become more open; the sternum moves forwards, and the spinal column slightly backwards, by the combined action of the scaleni and sterno-costal muscles on the first vertebral and first sternal ribs respectively; of the levatores costarum and external intercostal on all the lower vertebral ribs, and of the sternal intercostals on all the lower sternal ribs. On expiration these movements are reversed by the action of the internal intercostals, the external and internal oblique, recti, transversales and other muscles. The mechanism in the Mammalia is further assisted and modified by the addition of a large and powerful diaphragm. The thoracic ribs are articulated with the sternum by the medium of cartilages corresponding to the sternal ribs of birds: those ribs which are connected with the inferior curve of the dorsal arch have floating cartilages, and may be considered as a diaphragmatic set of ribs. When raised, the former approach each other, and the latter recede from each other anteriorly. Intermediate to these are the longer ribs connected with the dorsal arch, having their cartilages united, and articulated with the lower end of the sternum. The scaleni muscles invariably act during the whole time of inspiration. The external intercostals between the thoracic ribs are also throughout inspiratory; but those portions which are situated between their cartilages are expiratory; and those between the diaphragmatic ribs are inspiratory behind, expiratory to the side, and in front, and inspiratory between their cartilages. Between the intermediate ribs, they are for the most part slightly inspiratory between the ribs, and expiratory in front, between the cartilages. The external intercostals of the thoracic ribs are expiratory behind, and inspiratory in front, if the ribs approach these, and are inspiratory between their costal cartilages. Between the diaphragmatic and intermediate sets of ribs, and between their cartilages they are throughout expiratory. The levatores costarum draw the posterior portion of the lower ribs backwards. In the ass and the dog, the upper fasciculi of the serratus magnus are expiratory, the lower inspiratory, and the intermediate neutral. In man, the greater part of the fasciculi of this muscle is expiratory. In the ass, the lower fibres of the serratus posticus inferior are inspiratory, and the upper fibres expiratory. In the dog and in man, all are throughout expiratory.